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COMMERCIAL HANDLING, GRADING, AND MARKETING OF POTATOES



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THE exercise of proper care and the use of suitable standards in the preparation of the potato crop for the market would result in greater profit to growers and in the partial elimination of the enormous waste which now occurs.

This bulletin points out improper methods in use during the harvesting and handling of the crop and emphasizes the importance of greater care as well as the use of suitable, uniform, and fixed standard grades and containers.

Market demands and preferences should be heeded. Dealers and consumers do not desire badly cut, mashed, frosted, and decayed potatoes or those damaged by sunburn, blight, dry rot, or an excess of scab or second growth. Markets frequently are overloaded, prices seriously affected, and unnecessary losses sustained by growers because of the shipment of such unsatisfactory stock.

The requirement for standard grades are discussed and the advantages of suitable sizing machines, shipping packages, and proper car-loading methods are emphasized.

Methods of inspection by cooperative marketing associations to improve the quality of their output are described. The various outlets open to growers through which to dispose of their potatoes are outlined, and suggestions are given for the making of the bill of lading.

Contribution from the Bureau of Markets and Crop Estimates

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NEED OF BETTER METHODS.

WHILE potatoes are widely planted in nearly all States for use on the farm or in neighboring markets, the commercial crop moves from relatively definite, restricted areas.

The larger part of this crop must be transported to market by rail, and a large portion of the commercial movement enters into interstate traffic; thousands of earloads are transported long distances, and a very large portion of these potatoes are marketed in an unsatisfactory condition, because of careless handling and little or no grading. Such potatoes are unsatisfactory to shippers, wholesalers, retailers, and certainly to consumers. The railroads, too, are vitally affected, especially



FIG. 1.—Field sorting of southern potatoes over a machine into three sizes.

when rejected cars stand on track for days and weeks, the contents often bringing less than freight charges. This is most likely to occur when the roads are the busiest in the fall harvest season and when they have the greatest need for their cars. Quantities of cull and spoiled potatoes are sometimes left in the cars or thrown out along the tracks, emphasizing the vital need of careful handling, better grading, and fixed uniform standards of quality.

HANDLING SOUTHERN EARLY OR "NEW" POTATOES.

The early crop moves chiefly from California, Texas, Florida, North and South Carolina, Virginia, Maryland, New Jersey, Kentucky, Kansas, Oklahoma, Arkansas, and Louisiana. Typical sections are those of Florida and the Eastern Shore of Virginia, and as many of the methods used in these sections might be profitably adopted in other sections, their harvesting methods are here described.

Florida.—The principal potato-shipping section of Florida is located about Hastings. In 1915 this section shipped about 1,800 carloads between May 1 and June 1. The principal variety grown is the Rose No. 4. The potatoes are dug mostly with forks and not machine diggers, one reason being that there are not a sufficient number or large enough mules to work satisfactorily with the diggers. When digging with forks the potatoes from two rows are thrown together into one row. In all southern sections potatoes should invariably be picked and loaded into cars as soon after digging as possible in order to avoid sunburn and the consequent decay. The old method was to make two or three pickings, the first picker taking up only the No. 1 grade, the next the No. 2 grade, and then if the market warranted shipping the No. 3 grade or culls, they also were



FIG. 2.—Three barrels of new potatoes, sized over a machine, ready to head up. Note uniformity in size.



FIG. 3.—Early potatoes in veneer barrel ready for the burlap cover. Note the light, frail construction of the barrel.

gathered. In 1915, however, it is said about 60 per cent of the crop was run over the type of sizing machine shown in figure 1. Where the sizing machine is used, potatoes are picked into the slat crates holding about 50 pounds, also shown in figures 1 and 5. They are then hauled to the machine, which is placed in some convenient part of the field, in the grower's barn, or under a shed, where they are run over the sizer, from which they fall into barrels. The barrels are then headed and hauled to the car.

The sizing machine in the illustration, consisting of three sorting or sizing belts, is being run by hand, but it may easily be fitted up as a

power machine. The potatoes are emptied from the crates on to the apron of the sizer, as shown on the left end of the machine, and they slide down and on the first belt. This top belt of $1\frac{1}{8}$ -inch mesh carries all the No. 1 potatoes up the incline over the end of the belt and they drop through the chutes into the barrels for No. 1 grade. The No. 2 and smaller potatoes drop through the $1\frac{1}{8}$ -inch or top belt on the second belt of $1\frac{1}{2}$ -inch mesh. Here the No. 2's are carried up the incline and drop through the chute on one side into barrels. When the market will warrant shipping the No. 3 grade, the third chain or belt is used and potatoes which do not drop through its $1\frac{1}{4}$ -inch mesh are carried to a chute on the opposite side. The very small potatoes and dirt have then dropped through all the belts to the ground or out through another chute into crates. The pickers are supposed to leave the cull potatoes on the ground, while a man at the end of the machine is expected to pick out the defective stock overlooked by the pickers and still remaining when the crates are emptied on the apron of the sizer.

Figure 2 shows three barrels of machine-sized stock ready to be headed; from right to left these are No. 1, No. 2, and No. 3 grades. The tubers in each barrel are very even in size. The No. 2 grade varies only $\frac{5}{16}$ of an inch, all being between $1\frac{1}{2}$ and $1\frac{1}{8}$ inches in size, while the No. 3 stock varies only one-fourth of an inch, running from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches in size. The clean, attractive barrels used in this section are worthy of notice. This locality is one of the few in the country using double-headed barrels for potatoes. A bur-

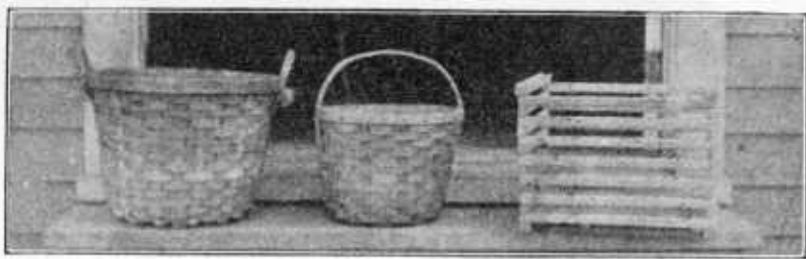


FIG. 4.—Large and small sized picking baskets, and a slat picking crate in which potatoes are picked and hauled to cars.

lap or cloth top is commonly used in other Atlantic coast sections in place of the wooden head. (See fig. 3.) The slat picking crate used in the field (see fig. 1) and for hauling to the grader is a folding crate and requires comparatively little storage space when stored between seasons. Its slats all have rounded corners, so that products can be handled in this package with a minimum of damage from cuts and bruises.

Buyers and wholesalers have freely praised the results of shipping machine-sized, hand-graded potatoes of uniform sizes, not only because such stock runs the same throughout the barrel, but because after the potatoes have been handled in the crates and over the machines they are usually dry when they reach the container and the field dirt has been shaken or rubbed off, so that very little goes into the barrel. Growers state that although more teams are needed on account of hauling from the field to the machine, a greater acreage can be dug, sized, and loaded per day than when graded in the field, because pickers can work faster and the potatoes are both sized and hand-graded over the machine more rapidly. In one packing house 900 barrels a day have been run over a power sizer, and it is stated that its daily capacity is from 1,000 to 1,200 barrels.

In handling this stock care must be exercised in digging in order that no potatoes shall be cut by the forks. Defective tubers should be left temporarily on the ground and not picked into crates, but when affected with any troublesome tuber disease they should later be picked up and removed from the field. The crates should never be filled above level full, for the potatoes might be mashed or cut when the overfull crates are stacked and hauled. Crates should be carefully and deliberately emptied on the machine; the belts should be fed evenly and never allowed to be overloaded. Best results can not be obtained when the machines are made to run too fast. Barrels should be shaken down at least twice while they are being filled, so that they will still be full and tightly packed on reaching the market.

Notwithstanding the very large holdings of old potatoes all over the North in the spring of 1915 and an increased production of new

potatoes from Florida, these new potatoes brought uniformly high prices. This is said to have been due partly to the excellent quality of the new stock, partly to the grading and packing, and partly to the fact that the distribution in the markets was good. Carloads were shipped to Panama and Alaska.

South Carolina.—In the South Carolina section where the Irish Cobbler is the chief variety grown, most of the potatoes are dug with a straight spading fork. In the Hastings section of Florida the negro help is paid by the day for its labor, but in the South Carolina section it is paid 10 cents a barrel for digging, picking, and packing the potatoes. No doubt the potatoes are not so carefully handled nor graded, because the diggers and pickers endeavor to complete as many barrels as possible each day.

A number of sizing machines have been shipped into this territory, but on account of the late rainy season in 1915 they were not given a fair trial. Two grades, No. 1 and No. 2, are marketed, but shippers state that through the lack of fixed standards for these grades and the growers' lack of care in grading, entirely too many small and defective potatoes are placed in the barrels.

One association manager states that he has been able to sell all of the potatoes loaded by his growers when he could guarantee their quality, but that many times he is forced to make consignments of carloads because the stock is not up to grade or is ungraded.

Virginia.—The Irish Cobbler is the principal variety shipped from the heavy producing section of the Eastern Shore of Virginia, about one-half of the seed being secured in Maine, the other half being specially grown locally. Digging begins in this section about June 1.



FIG. 5.—Method of loading and hauling potatoes in crates to cars for shipment in bulk.

Nearly all growers plow out their potatoes, only a few using machine diggers. The potatoes are then scratched from the dirt by hand and picked into baskets, from which they are emptied into barrels (see fig. 4). The illustration shows two of these baskets, the smaller costing the grower about 25 cents and the larger 50 cents. It has been

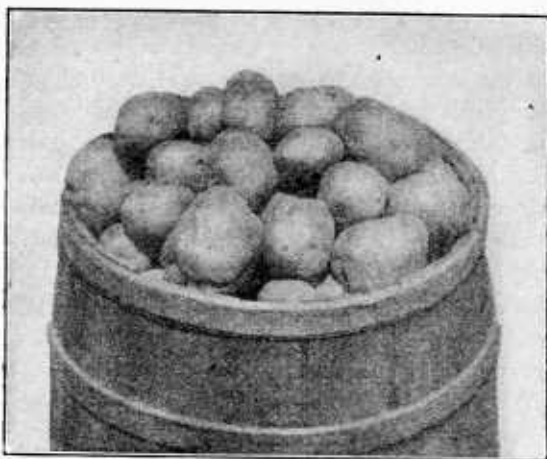


FIG. 6.—A well-filled barrel of fancy, clean, early Virginia potatoes ready for branded burlap cover. Note strong construction of barrel.

found very important in hot weather that potatoes shall not remain in the field in the hot sun, so in this section the best method seems to be to dig the potatoes late in the afternoon or evening and have the pickers in the field at daylight in order to get the cool potatoes into the barrels and haul them to the cars before the day becomes hot.

During the 1915 season several hundred carloads were shipped in bulk, an unusual method in this section, but on account of the extremely low prices growers resorted to this procedure to save the barrels and covers, costing $26\frac{3}{4}$ cents. One advantage to the buyer of potatoes loaded in bulk is that the defective stock shows up very plainly. These potatoes marketed in bulk were picked into bushel slat crates (see fig. 4), costing the grower 18 cents each. These crates were loaded on wagons and hauled direct from the field to the cars and then emptied (see fig. 5). It can readily be seen that this type of package is a very convenient and suitable receptacle for this purpose. Its rounded slats prevent cuts and bruises; it is handy, durable, and can be folded up and stored in a small space during the winter. Pickers here are usually paid 10 cents per barrel or 3 cents per hamper when following the plow, but in 1915 the price was in some cases reduced to 8 cents per barrel and pickers following the digger were paid 2 cents per crate of 60 pounds. This reduced rate probably will not apply in normal seasons.

It is said that about 125 sizing machines, similar to those used in Florida (see fig. 1), were shipped into this section in 1905, but the extremely low prices prevailing for potatoes interfered somewhat with their general use.

The management of the growers' cooperative marketing organization which shipped over 10,000 carloads of potatoes from this section in 1915, strongly believes that proper grading and handling of the crop is of primary importance. Although this organization has become widely known for its dependable output, the management is not yet satisfied with results and is endeavoring and planning to standardize its shipments still further. An inspector is employed at each of about 44 loading stations maintained by the organization and a chief inspector looks after the work of all. These inspectors are held strictly responsible for the grade of shipments leaving their stations and each one realizes that his standing with the organization depends largely upon how many or how few ears inspected by him and shipped from his station are eventually rejected or are the cause of complaints on arrival in the markets.

The organization has established an enviable reputation on its first grade of potatoes. Each barrel of its best grade is shipped under a branded cover and when potatoes which do not come up to the requirements of the grade are received under such covers at the shipping stations the cover must be removed and a plain one substituted or the contents must be regraded, as nothing but first-grade stock is allowed to go out under this brand. This grade calls for stock about 2 inches in diameter. The two sizing belts on the grading machines shipped into this territory are of $1\frac{1}{16}$ and $1\frac{7}{16}$ inch mesh. The potatoes must be bright, free from second growth, disease, and other defects. Seabby, worm-eaten, or sunburned potatoes are barred. Stock which does not meet the requirements of the first grade is shipped in barrels bearing unbranded cloth or burlap covers. (See



FIG. 7.—Barrel of potatoes in car doorway partially emptied into tub allowing inspector to make careful examination.



FIG. 8.—Digging scene on a large potato farm near Moorhead, Minn.

fig. 6.) All barrels must be well shaken down and well filled so that they will be full and present an attractive appearance on arrival on the market.

When a car is loaded by more than one grower, the association's representative marks the grower's initials on each barrel placed in the car, in order that the stock may be identified and traced if there is any question regarding the quality, either at shipping point or on the market. Frequently with potatoes marked in this manner an adjustment may be secured on a rejected car by making an allowance only on the potatoes placed in the car by one grower, while if the number of barrels in the lot is unknown, the allowance would probably have to be given on every barrel in the car, although perhaps only 15 or 20 barrels were loaded by the offending grower. The chief inspector seeks to have all growers who employ several pickers give each a number which must be marked on the outside of every barrel filled by him. This practice enables the inspector at the car door to do better work, because when he finds that one picker continues to do poor grading, the barrels bearing his number may be marked down to a lower grade, be sent back for regrading, or the picker may be replaced.

The method of inspecting barreled potatoes is shown in figure 7. For this purpose one-half of a barrel is reinforced with extra hoops and a sufficient number of barrels from each grower's load is partially emptied into this half barrel for examination to enable the inspector accurately to judge his receipts. It can readily be seen that deception in packing is kept at a minimum by this method.

Between \$30,000 and \$40,000 a year is appropriated by the directors of this organization for its inspection service. In 1914 its grow-

ers were paid nearly \$6,000,000 for the products marketed through this organization; in 1915, notwithstanding the very disastrous season caused by "glutted" or oversupplied markets, low prices, and an unusually heavy production of early potatoes at the time they were shipping, the percentage of cars consigned was less than usual, practically all of their shipments being sold outright. These facts indicate that their endeavors to maintain uniformly high grades must be in the right direction.

There are a number of other growers' organizations that market potatoes from Virginia, Maryland, Delaware, and New Jersey, most of them endeavoring to bring about better and more uniform grading. In at least one of these sections many grading machines have been bought. In most of the potato sections of these States a No. 1 and a No. 2 grade are recognized, but entirely too large a part of the crop moves out under the No. 1 grade. The result is that freight is paid on much defective or worthless stock mixed with the good potatoes. This stock, which it is frequently necessary to sort out after reaching the market, should be taken out on the farm.

HANDLING NORTHERN LATE POTATOES.

The 12 heaviest late potato producing States of the North and West are Maine, New York, Michigan, Wisconsin, Minnesota, Pennsylvania, Ohio, Illinois, Iowa, Nebraska, Colorado, and Idaho.

DIGGING.

Digging usually is begun some time between the middle of August and the middle of September, and the bulk of the crop is dug and

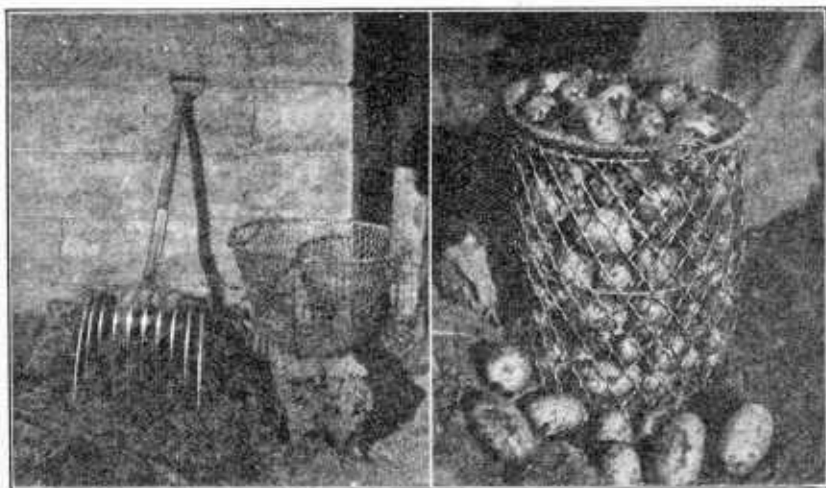


FIG. 9.—Two types of wire picking baskets, and a fork or scoop for forking potatoes.



FIG. 10.—Four-horse diggers, wire picking baskets, and field boxes; bulk loading into wagon.

stored by about October 15 to escape the possibility of freezing weather.

Northern potatoes are dug by hand with fork, with the plow, and by means of the large two or four horse digging machines (see fig. 8). For large areas it is economical to use an elevator digger, of which there are several types. Some weigh as much as 1,000 pounds and are drawn by two, four, or six horses, according to the condition of the land. When conditions are favorable, the use of a digger is recommended as the work may be done more quickly and more economically. An elevator digger will turn out from 3 to 5 acres per day, depending upon the nature and condition of the ground. If a grower has only a small acreage planted to potatoes and is unable to purchase a digger himself, one may be bought cooperatively with his neighbors, the cost to each thereby being reduced, and most of the advantages of a privately owned machine secured.

In the Red River Valley potato district of Minnesota mechanical diggers are used almost exclusively, while in Wisconsin forks as well as mechanical diggers are used. In the Upper Peninsula of Michigan a long-handled fork having five prongs, each about 14 inches long, is used for nearly all digging. In some instances ordinary one-horse plows are used.

The heavy losses due to rough handling, cuts, bruises, and the consequent decay are not generally realized on the farm. A visit to the retail stores where many such unsalable potatoes are sorted out and lost would show growers one reason why the retailer must secure a seemingly large price over his first cost. Much of this waste can be

directly attributed to improper methods employed in the use of machine diggers and to rough handling, and can be prevented to a great extent by the use of more care and less haste.

Some growers believe that by using a fork greater care can be exercised than with a plow or machine, the loss being reduced to a minimum, but this method of digging is so slow that it is not economical on large areas. Deep plowing with the machine and plow will help to reduce the number of cut potatoes.

PICKING.

In these regions potatoes are picked in the field almost exclusively by hand. Several types of combination digging and picking machines are on the market and a few are in use in the late-potato States. For successful use the grower must have ideal soil conditions and the buyers of these machines are expected by manufacturers to know if they have conditions which will warrant purchasing such machines. These machines not only dig the potatoes but deposit them either in crates or bushel piles windrowed across the field. Where soil conditions are suitable they should be labor savers.

Transient and local help, which sometimes includes boys and girls, is used where the crop is picked by hand. A day's picking ranges from one hundred to two hundred bushels, depending upon the ability of the worker. It requires on an average five persons to pick up after one digging machine. If the potatoes



FIG. 11.—One style of sizing machine for field or warehouse use.



FIG. 12.—Three barrels of decayed potatoes sorted from one end of a car of bulk stock. These potatoes caused much more stock to be wet and unattractive.

are to be graded in the field as gathered, the pickers should be thoroughly instructed before the digging begins as to the requirements of the grades. The inclusion of a few diseased, cut, or defective potatoes is sufficient to discount an entire shipment, for its selling value is largely determined by the poorest in the lot rather than the best.

Potatoes are picked into the bushel wire basket (see fig. 9), the folding slat crate (see fig. 4), and a square bushel box. The wire basket is the most extensively used and in some places the potatoes are emptied from the baskets into field boxes which later are emptied into wagons for hauling to the car or warehouse. They are then handled one or more times with shovels or scoops. (See fig. 9.) In other places the filled wire baskets are emptied into sacks in the field and these are hauled half full to storage cellars, houses, or the cars and there emptied. Hauling loose in a wagon from the field is a bad practice, whether to the car or storage house, and is not recommended, as potatoes are seriously damaged by repeated handling, and such methods do not appear economical. (See fig. 10.)

From observations and investigations made by representatives of the Department of Agriculture a crate with rounded slats holding about a bushel is recommended instead of a picking basket or box. Potatoes picked in this crate can be loaded on a field wagon and hauled to the storage house or car without any dumping or rehandling (see fig. 5).

SIZING.

Sorting or sizing machines of various types are used in many districts, some operated by hand and others by gasoline or electric motor. The object of these machines is to sort the potatoes for size and

eliminate the dirt, but it is believed that too many growers and shippers leave the grading for quality as well as the sorting for size to the machine. If properly managed, it will size the stock satisfactorily, but every grower should do his part by carefully removing by hand all defective potatoes.

Potato sorting for size as accomplished over machines is more accurate, satisfactory, and rapid, and by many is considered more economical than the old method of hand-and-eye sorting. The uniformity of size obtained enables the seller definitely to recommend and guarantee the size of his potatoes. Any sizing machine used should be so built as to allow a large apron and a long belt or other sizing device (see fig. 1). The large apron or table on the machine is necessary in order that the operator or sorter may have ample opportunity to remove all defective stock before the potatoes go on the belt or other



FIG. 13.—Rack or sorting table for grading potatoes by hand.



FIG. 14.—Selected, nearly perfect, uniform-sized, wrapped baking potatoes. Shipped in about 100-pound crates.

sizing device. A sufficiently long machine or belt is essential in order that the tubers will have sufficient distance to travel so that they will be properly sized before leaving the machine.

To obtain the most economical results with mechanical sizers of any description a continuous supply of potatoes should be on hand so that the machine and men tending it will be kept constantly employed. The drop from the

machine into the shipping packages or other containers should not be a long one and the potatoes should be safeguarded against bruises or cuts not only in dropping from the machine but during all the time they are in or on it. Every precaution should be taken to avoid their coming in contact with sharp projections of any kind.

The hand sorters are of various types. The type which is in general use in the Moorhead district of Minnesota, sizes the potatoes over rods spaced an inch and five-eighths and an inch and one-quarter apart. It is portable, light, and may be used either in the field or the warehouse. The type of machine already described (see fig. 1), used in Florida and other Atlantic coast sections, is also used in Maine, New York, and the Northern Central States. Another (see fig. 11) designed especially for field sorting but also adapted for warehouse and cellar sorting is about 5 feet high, 7 feet long, and 33 inches wide over all. The upper screen is about $3\frac{1}{2}$ inches above the lower or dirt screen. Sizing is accomplished by swinging the hoppers forward and backward by the hand bar at the top of the rear end of the hopper. The larger potatoes come off at the right over the top screen and the smaller potatoes come off at the left, over the lower screen.

In another type of sorter adaptable for warehouses, cellars, loading stations or cars, the potatoes are placed in the lower hopper and are sized as they pass upward on an endless flexible screen. The small potatoes, dropping through, pass out at the side, free from dirt, over a stationary slanting dirt screen. This machine is somewhat similar to the one shown in figure 1.

These descriptions are furnished only to give a general idea of machine sizers since there are a number of other types of potato sorters on the market.

A larger percentage of the commercial crop of potatoes should be sorted for size by machinery, in the field or at the warehouse, to eliminate the undersized stock. If dug during wet weather, machine sizing will separate much of the dirt from the potatoes. Complaint has been heard from buyers regarding the dirt frequently found in shipments. They claim they do not receive sufficient allowance for dirt when sorters are not used and that a general use of sorters would tend to alleviate this trouble.

GRADING.

It seems quite unnecessary to say that no machine has been made which will grade potatoes as to quality. The mechanical sizer simply sorts as to size, and the stock must be further graded by hand to eliminate potatoes affected by sun burn, dry-rot, scab, frost, cuts, or other defects. Investigations in nearly any wholesale market, of the manner in which potatoes are prepared for market by the shipper,

will usually convince the most skeptical that there is great need of improvement. On every side may be seen quantities which must be sorted before they can be sold or which must be sold ungraded at reduced prices. Large and small, smooth and scabby or otherwise defective potatoes frequently are all shipped together.

The amount of money lost to growers, dealers, and consumers each year through the shipment of ungraded or poorly graded potatoes can not be estimated, but that it is very large and mostly unnecessary must be admitted. In many markets scores of men may be seen in cars sorting potatoes. Large quantities that are frosted, decayed, badly cut, bruised, diseased, or otherwise defective are thrown away. Usually these are the grower's losses and besides losing the invoice value of the defective stock culled out of these cars, he is also paying about twice as much for the labor as though he had graded the potatoes on the farm. The railroad receives the only full returns on such cars, for their charges are based on the quantity of potatoes hauled and not on the quality.

Quantities of cull potatoes sorted out of supplies sold to consumers may also be found in most retail stores that handle vegetables. Notwithstanding these losses by wholesalers and retailers, much undesirable stock is passed on to the housewife. This is a common complaint among consumers and they frequently ask why they do not receive better potatoes, stating that they do not buy and use as many potatoes as they would if good ones were always received.

It is found in all sections that the potatoes loaded into cars and shipped from the field at digging time, usually receive less care in sorting for size and grade than those shipped later in the season from warehouses or cellars. This is partly due to the rush to get the crop harvested and partly to carelessness. During some seasons hundreds of carloads are forwarded which, when loaded, are known to have been more or less frosted or frozen in the ground, or sometimes after digging or loading. When a grower or shipper knowingly loads such stock he invites disaster, rejections, and losses. During the fall of 1915 hundreds of cars containing blighted, frost damaged, or otherwise diseased and decaying potatoes were shipped. A broker in one city in the Middle West stated that in the previous three weeks 150 cars of potatoes had been rejected on that market on account of poor condition. As this report concerned only one medium-sized market, for just three weeks, the total number rejected for this reason on all markets must have caused serious losses. These potatoes, no doubt, were shipped direct from the field.

Many of the cars of potatoes received on the markets, both bulk and sacked stock, contain only sufficient frosted or otherwise defec-

tive tubers to show a few "rots," but the sacks or potatoes near them become wet, and it is then necessary to sort the entire car at heavy expense. Figure 12 shows three barrels of "rots" taken from one end of a car of Maine bulk potatoes.¹ While the actual quantity of potatoes lost was only about 20 bushels altogether, the freight on these and the labor charges for sorting the entire car at destination made a large bill for the grower to pay.

If all growers could have enough storage space so that their crops, when partly frosted or otherwise defective, could be held after digging until the damaged potatoes could all be detected and sorted out, instead of dumping them on the market immediately after digging, all concerned in marketing them would realize more money, as a rule. One dealer stated recently that in his opinion sentiment has as much to do with the potato market at times as have supply and demand. It is certain that when markets have been flooded for weeks with frosted stock or stock which shows more or less decay, every one concerned in the marketing of this crop becomes disgusted and the result is a "sick," "draggy" market on which every buyer expects to receive stock at a discount and waits until he does get it at a reduced price. Buyers are then afraid to pay the better price for good potatoes on account of the low price prevailing on "off" stock.

The larger part of the commercial potato crop is stored by growers or dealers and since this must be rehandled and most of it sorted to make certain no decayed stock is shipped, little extra effort would be necessary to grade the potatoes according to fixed standards. The results would more than justify the slight extra expense. The sorting table or "rack" as it is called (see fig. 13), is used extensively in Maine and some other districts to sort and grade potatoes when they are shipped from storage. They are emptied on the high end of the rack and as sorted by hand run out at the lower, narrow end into barrels or bags.

Wholesale dealers claim that potatoes always should be bought from producers on their merits but that at present in many places practically all grades are bought at the same price. This neither penalizes the careless grower nor rewards the progressive; on the contrary it rewards slack methods and penalizes careful grading. Some dealers freely admit that in their opinion the dealers and all other buyers at points of production are largely responsible for present conditions because they have not given growers sufficient encouragement to grade carefully by always discriminating in price in favor of fancy stock. Competition in buying as well as in selling

¹ Further data concerning the loss encountered in shipping such potatoes is shown in: More, C. T., and Branch, G. V.—Marketing Maine Potatoes, U. S. Dept. of Agriculture, Office of the Secretary, Circular No. 48, 1915.

is very keen. Each buyer or dealer desires to do as large a volume of business as possible, and just as long as the potatoes he purchases can all be resold, everything offered him by growers will be bought almost regardless of grade. If one buyer at loading point refuses a load or a car on account of quality, usually there is another buyer ready to take it at the same price. Inspection by buyers at loading point is not as close and careful as it should be and too much is taken for granted. More care at this point would prevent many later rejections.

A large part of the grading and nearly all of the sizing in northern sections now is done by the local dealers or warehousemen and by the distributors' representatives at their warehouses or loading stations. Of course, the grower is relieved of this extra labor, but he must pay for the buyer's expense in accomplishing this work by taking a lower price for his product and sometimes losing the feeding value of the culls besides.

It should be remembered also that when growers leave the grading to the warehouseman they put themselves just that much further away from direct dealing with the independent cash buyer or from direct sales to dealers in the cities. However, if the grower lacks the willingness to grade his potatoes effectively it is as well that the warehouseman or local dealer should do it.

NEED OF STANDARDIZATION.

The impression prevails that the greatest problem facing the fruit and vegetable growing industry is that of marketing, and the standardization of these products is acknowledged to be one of the most important phases of that problem. Only a start has been made in this country looking toward the standardization of agricultural products. Standards for fruits and vegetables are difficult to establish because of their perishable nature, the wide difference in varieties, and the varying conditions under which they are grown. Standardization is generally taken to mean the establishment of suitable standards of quality which will include such regulations concerning the digging, handling, sorting, sizing, and packing, as will insure a uniform, standard product of high quality. It should be extended to include the shipping containers used.

It is equally important, however, that standardization be applied to the production of this crop. An effort is being made in many States to standardize the varieties grown. This movement aims to confine the planting in each section to a very few varieties which have been proven the best for that locality. An endeavor is then made to plant only seed true to name and of the best selection. The result of such methods is to standardize these few varieties of pure

strains and eventually make the section widely known as producing certain varieties to a high degree of perfection and in large quantities.

There is a special need of standardization of potatoes, because they occupy such an important place on the tables of most families. Wholesalers and retailers usually aim to handle potatoes on as narrow a margin of profit and expense as possible because they are such a bulky, comparatively low priced and widely used commodity, but in order to be handled on the narrowest margins the product must be standardized so that expense and risk in handling, waste, and loss are reduced to a minimum. The demand at this time is for the establishment of uniform grades for potatoes which shall be accepted as the basis for all trading in this crop throughout the country. Such nationally accepted grades would give buyer and seller a foundation on which to deal with a better understanding and mutual confidence.

To-day each grower or community usually grades according to local custom, if at all, and as a result wholesale dealers have very little confidence in the quality of their purchases until they are carefully inspected. For this reason these firms prefer to buy from large shippers or farmers' cooperative marketing agencies, that have built up a reputation for shipping only uniformly high-grade products.

The manager of a growers' association that markets truck crops and small fruits stated recently that they had gone out of their regular line during the past season and marketed a large crop of barreled apples. When asked if these were packed under the State apple-grading law and also regarding the success of this law and grades, he said: "It certainly has been the means of great improvement, for I sold that crop of apples without seeing or inspecting them, to a distant buyer who had no means of inspection until the fruit arrived, all on the statement that the fruit was packed under these established State grades, and every car was accepted on arrival." This is a concrete example of what is being accomplished on a crop which is far more perishable than potatoes and which requires more careful handling and packing.

Organizations of growers and shippers have advocated National standards and grades for potatoes, which the various States might also establish, in order to obtain fixed uniform standards. The States could compel the use of such grades whenever any grades were used, thus forcing growers, buyers, and dealers on the market to use and respect those grades. All rejections and disputes will be much easier to adjust when such a basis is established.

The diversity in varieties and shapes and the difference between the early and late crops must be recognized, and it is possible that variations in standards will be found necessary.

MARKET PREFERENCES.

It can not be said that market demands are unreasonable. The standards demanded or preferred by the wholesale dealer are not to be feared. A few large consumers, such as railroad dining-car departments, hotels, and clubs, are willing to pay an extra price in order to obtain specially selected, practically perfect stock, such as is shown in figure 14. It is said that at times the offerings of potatoes of this grade are not sufficient to meet the demand.

Most growers, however, are more interested in the demands of the average consumer. This great class of buyers asks only for a grade of potatoes which is sound, free from culls or waste stock, and of good average size. The important point is that this class of consumers does not like to pay retail prices for defective, diseased potatoes or any commodity on which there is an unnecessary waste in preparation for the table. Deep-eyed potatoes are not so desirable as the shallow-eyed, smooth varieties. Dealers state that in addition to these two classes of buyers there is a sufficient outlet among other classes of trade for a good second grade of potatoes.

It is a mistake, then, for growers or shippers to force ungraded or poorly graded potatoes on the second great class of buyers, the average consumer who uses the larger portion of the crop, for these potatoes do not meet the demand and will seldom return the grower as large a profit as will well-graded stock.

REQUISITES OF STANDARD COMMERCIAL GRADES.

The investigations conducted have not proceeded to a point where it is deemed wise to recommend definite grades for potatoes, but the need and value of such standards is generally recognized. It is believed that with relatively little trouble and expense needed improvements can be made and better results in marketing realized. The suggestions that follow, concerning requisites of standard commercial grades, are given for this reason and in order to assist growers, shippers, associations, or others now interested in the standardization of this crop.

From the investigations conducted up to this time and from a consideration of present commercial practices, it would appear that only two regular commercial grades would be necessary for the large commercial potato movement: No. 1 and No. 2 grades. In addition a "Special" or "Extra Fancy" grade of large potatoes might be provided, for the dining car and hotel trade. Potatoes for this special grade should be of uniform size, from 10 ounces to 1 or 2 pounds in weight, smooth, clean, and free from all defects. Potatoes of this grade, when crated, are usually wrapped. (See fig. 14.)

Fruits and vegetables sell largely upon their appearance, therefore the specifications for the No. 1 grade should be drawn to make it as

good and attractive in appearance as is reasonable and practicable. These specifications should practically eliminate potatoes damaged by frost, sunburn, blight, common scab, dry rot, decay, second growth, cuts, bruises, or dirt, and also undersized or coarse stock. The minimum and maximum sizes for both No. 1 and No. 2 grades are still a subject for careful investigation, discussion, and demonstration. However, a minimum of about 2 inches is maintained in a number of early or "new" potato sections, and the commonly discussed minimum for this grade is from $1\frac{1}{8}$ to 2 inches. The minimum diameter for a long variety should probably be a little smaller than for a round one. Since it is practically impossible in grading any perishable products commercially to secure a perfect grade, reasonable tolerances should be allowed. The No. 1 grade should be packed in new, clean sacks or barrels, each to contain one variety only and to be well filled and securely sewed or covered.

Most growers and shippers appear to be prejudiced against marking or selling any product as No. 2, or second grade. This feeling should not prevail, for it seems certain that when a crop is properly sorted and all grades sold strictly on their merits, the average price obtained will be higher than for ungraded or poorly graded stock.

All growers should aim to produce as large a proportion of potatoes of No. 1 quality as possible, and if the crop is all of first grade it should be so marked, but some persons apparently wish to continue the practice of making only one grade or of making the first grade include entirely too large a part of the crop, in fact nearly all of it, when the crop as a whole falls far short of first grade. When market demands are considered it can hardly be supposed that such grading would accomplish the results desired. Such a grade would be neither as good nor as attractive as it is possible and practicable to make it, because there are in most crops many slightly imperfect, undersized, or coarse potatoes which if removed would leave a strictly first-class grade and yet these imperfect potatoes of themselves would constitute a marketable No. 2 grade. It is to be remembered also that very frequently a grower's crop from some cause—weather, soil, season, or seed—runs under average size, or in some other way contains so large a percentage of stock not of No. 1 grade that it seems best to market the entire crop as No. 2 grade. The No. 2 grade should include no stock which is not of desirable quality both for market and for table use and should be of fair average size. While broad enough to include a reasonable amount of imperfections not allowed in the No. 1 grade, such as potatoes showing a reasonable percentage of second growth, cuts, or common scab, this grade should not contain all that is left when the No. 1 grade is taken out, for the culls should be kept on the farm. The minimum size possibly should be as much as one-fourth to three-eighths of an inch lower than for No. 1 grade. Every sack,

barrel, or other package containing potatoes of this grade should be plainly marked "No. 2 grade."

In order to eliminate the deception sometimes practiced in the past, no facing or topping with the best or largest potatoes should be allowed in barrels, sacks, or other containers. The average of the potatoes in the face of any container should represent fairly the average quality and size of the entire contents of the package.

If further investigations show that it is necessary to have one standard for northern or "late" potatoes and another for southern or "early" potatoes, that may be arranged. However, at this time the standards here discussed seem suitable for both the northern and southern crops. In devising standards for potatoes both the preferences of the trade and the consumer throughout the country and the needs of the grower and his crop as produced in various sections must be harmonized. The grades must be neither impracticable nor unfair to the growers, dealers, or consumers.

IMPROVEMENT THROUGH COOPERATIVE ORGANIZATIONS.

In most producing sections it is found very difficult, if not impossible, to secure any considerable voluntary improvement in the grading and handling of products except through the endeavors of cooperative marketing organizations. By reason of a lack of knowledge of market requirements, carelessness, or a desire to force the market to take such stock as it suits his convenience to ship, the grower has failed to a large extent to make any headway in the standardization of the crop. Although this lack of standardization is often the cause of glutted or draggy markets it is everywhere found extremely difficult to induce the individual grower to prepare his crop for market properly. There are numerous benefits to be gained by growers shipping their potatoes through a strong cooperative marketing organization and this has been demonstrated to be the most successful method of securing a uniform grade of perishable products, properly packed in standard packages. Farmers' cooperative marketing organizations, or strong private shipping firms supply the major part of the standardized fruits and vegetables found on the markets at this time. Many of these organizations and private agencies may be found in Florida, California, the Northwest and other localities. Many of them have found it necessary, in order to build up a profitable business and establish a reputation on the market for shipping products of high quality, to establish their own association, or private packing plants, in which the products delivered by the growers in bulk may be graded and packed by skilled workers.

Attention is called to the description of the handling and inspection methods of a potato association in Virginia, page 9. Another

organization in Idaho is meeting with success in its grading, but an unusual system is in use. A part of the crop is sorted into grades according to weight, four to six ounce grades, six to eight ounce, eight to twelve, twelve to sixteen, sixteen to twenty, and from twenty ounces up. At principal loading stations power graders have been installed. A chain elevator carries the potatoes from a hopper to a long table. Here pickers remove singly and by hand each desirable potato from the conveyer to another chain conveyer which carries one potato in each compartment, to the end of the table, where they are automatically sized according to weight. The potatoes are then boxed or sacked according to the grades already mentioned.

In this locality it has been found impossible to get some of the growers to eliminate enough of the defective potatoes to make a proper commercial grade. Therefore, community or association grading warehouses were found an absolute necessity, and were used for sorting out their usual commercial grades before this more exacting system was installed.

A number of other cooperative potato marketing agencies in other States, some quite successful, might also be cited. Cooperation in marketing can not reach its highest degree of success unless it is supported heartily by all the growers.

CONTAINERS.¹

Potatoes should be packed in new, clean containers, of uniform size. The use of second-hand sacks, barrels or other packages, should be discouraged. It is important that the containers used for every farm crop shall be, first, sufficiently strong and durable, and then attractive; otherwise the profitable marketing of the crop may be handicapped. Nearly all farm products must be transported over long distances and after they reach the large market they may be reshipped and rehandled many times, so that only strong packages which will stand this handling should be used. If it is necessary to use second-hand containers, only those that are clean and in good repair should be chosen. The attractiveness of the package as well as the stock, has much to do with the price which will be realized, and broken or dirty barrels, crates, or hampers, or rotten, ragged, dirty sacks are not attractive and will not transport the contents safely to market.

No standard container for the shipment of potatoes has been established by law, but the Federal standard barrel act fixes the capacity of the barrel commonly used for potatoes. There are now a number

¹ For a description of crates and requirements for exporting potatoes to South America see Commerce Exports, No. 212, Sept. 10, 1915, page 1236—"Developing Trade in Potatoes with South America," by Clarence W. Moomaw.

of types and sizes of containers used for the shipment of potatoes in different parts of the country. In California the lug box and the burlap bag holding 100 to 120 pounds are used. Burlap bags varying in size from 100 to 120 pounds are used in practically all sections west of the Mississippi River; an 85 to 90 pound sack is used in Mississippi. In the Moorehead, Minn., district the 2-bushel sack is used almost exclusively. In other sections of Minnesota, Wisconsin, Michigan, New York, and Maine many potatoes are shipped in bulk. Bags holding 150 pounds are also used in Minnesota, Wisconsin, and Michigan, while in New York and Maine bags holding 150 to 165 and 180 pounds are used. In the past veneer barrels and wooden stave barrels holding 10, 11, and sometimes 12 pecks, or 150, 165, and 180 pounds have been used in Maine and along the Atlantic Seaboard (see figs. 1, 3, and 12). Virginia, North and South Carolina, and Florida have shipped nearly all of their crop in these 10 and 11 peck barrels. Complaint is made that machine-made veneer staves or plaited veneer barrels used in South Carolina and some other sections (see fig. 3) are not satisfactory as containers for potatoes. They seem especially unsuited for shipping to western markets, the heavier stave barrel used in Virginia being preferred because too many of the lighter ones get crushed or go to pieces in the cars or before they have passed through the trade channels to the retailer.

The act of March 4, 1915 (38 Stat., 1186), commonly known as the standard barrel act, among other things, provides for a standard barrel of the following dimensions: Length of stave, $28\frac{1}{2}$ inches; diameter of heads, $17\frac{1}{8}$ inches; distance between heads, 26 inches; circumference of bulge, 64 inches, outside measurement; and the thickness of staves not greater than four-tenths of an inch. The capacity of this barrel is 7,056 cubic inches. (This capacity is a little more than 3 bushels.) This act is administered by the Department of Commerce through the director of the Bureau of Standards. Requests for information in regard to its interpretation and enforcement should be addressed to that department.

Early new potatoes are shipped from some parts of Florida and some other Southern States in bushel hampers. Only a very small percentage of the crop is shipped in this way. The railroads make strong objections to this package, pointing out that it is not of sufficiently strong construction to be a safe container for such articles as potatoes, cucumbers, and squash, and the condition of many shipments examined in the markets proves the justice of their contention. When hampers are used a particular method should be observed in loading as described on page 30. Crates and boxes are usual for the "Extra Fancy" or "Special" grade of potatoes prepared for dining cars, hotels, and restaurants. These are mostly of about 45 to 50

and 100 pounds capacity. (See fig. 14.) A slat crate containing about a bushel is used in parts of Mississippi for new potatoes.

The use of containers of so many types and sizes for potatoes seems entirely unnecessary. It causes confusion in the markets and makes the quoting of market prices more difficult. The cloth-top barrels used extensively in the East are not an attractive package, and as sometimes handled and loaded in cars are frequently the cause of losses to shippers. The veneer barrel has been referred to previously as an unsatisfactory package for potatoes. On account of their weight it is usually necessary to employ two men to load and handle potatoes in barrels or the large 10, 11, and 12 peck sacks. In some markets men may be seen handling these large sacks with hooks similar to hay hooks. This practice can not be too severely condemned, as the hooks are certain to injure the potatoes in the bags.

Investigators of the Department of Agriculture have made careful inquiries among shippers, associations, and dealers in the markets to learn the general sentiment concerning these packages and a standard container to replace them. While there are a few good reasons for the retention of some of the packages now in use, there is a very general feeling that a burlap bag holding about 2 bushels, or 120 pounds, is the most satisfactory package now in use and that it would be feasible and desirable to replace the larger bags and the barrel with this container. Some doubt is expressed as to the advisability of shipping in sacks the early immature potatoes that now move in barrels, on account of the likelihood of their becoming skinned and bruised, but it is to be remembered that nearly all of the early potatoes grown in California and all of those grown in Texas, Oklahoma, Louisiana, and Kansas are successfully shipped in sacks holding about 120 pounds. Potatoes in that package are easy to handle and load safely and well in cars. It has proven a satisfactory container.

A few experiments have been made in preparing potatoes for market in smaller containers which, after passing through the usual trade channels, will eventually reach the consumer in the original unbroken package. Cardboard or similar containers holding from 10 to 20 pounds have been used. One holding an even peck and bearing neat advertising on each side has been noted. It appears certain that a profitable trade in uniform, fancy, graded potatoes in such packages could be established in most cities through enterprising retailers. The principal requirements seem to be well-graded stock, possibly each package containing only potatoes of one size, as from 6 to 8 or 8 to 10 ounces; a continuous supply; wholesale and retail dealers willing to make an effort to introduce such a package and push it, and lastly, an article at a fair price.

BRANDS.

A brand is a distinctive identification mark and its use is a very effective advertising medium. Several large potato-shipping associations have adopted brands which have become well known, and these have doubtless been of value in selling their output when the grade has been kept up to standard, so that critical buyers might depend upon always securing the same quality.

Most of the box apple shippers of the West and the orange shippers of California and Florida have adopted brands and labels. Their results have shown that fruit shipped in this manner sells more readily and generally brings more money. Branded material or sacks should not be loaned or sold to neighboring farmers or shippers who may not grade their stock. The use of a brand is recommended only when a shipper intends to establish and maintain a reputation for the quality of his potatoes, for if the grade and quality are not sustained the purpose for which the brand was intended is defeated.

MARKING PACKAGES OF POTATOES TO SHOW QUANTITY OF CONTENTS.

The act of March 3, 1915 (37 Stat., 732), commonly known as the net weight amendment to the Federal food and drugs act, provides in substance that an article of food shall be deemed to be misbranded if it be in package form and the quantity of the contents be not plainly and conspicuously marked on the outside in terms of weight, measure, or numerical count.

All articles of food, including potatoes, shipped in interstate or foreign commerce, or offered for sale in the District of Columbia or Territories of the United States, are subject to the provisions of the net weight amendment, if in package form. This act is administered by the Bureau of Chemistry of the Department of Agriculture. All requests for interpretations of the law and for instructions with regard to marking packages should be addressed to the Chief of the Bureau of Chemistry, Department of Agriculture, Washington, D. C.

LOADING CARS.

Experience in the barrel apple States has demonstrated the best method of loading apples packed in double-headed barrels. The same method has proven safest in Florida for potatoes in similar barrels. Figure 15 shows this method. The barrels are lying down across the car. Three placed together end to end will extend across the car except for a space of about a foot and a half. This space should be left first on one side and then on the other; that is, if the first three barrels on the bottom are loaded from the right of the car,

the next row above should start from the left. This will bring the bulges of the barrels in the second row between the bulges of those below, which will make the load ride better and relieve the pressure on the bulges of the barrels. As each successive row is placed on the bottom of the car the barrels should be "chocked" so that the loading will be kept tight until the car is full to the doors. The barrels so loaded will usually come out just even and make a solid load; if they do not they should be well "chocked" or braced in the center of the car. Unless the barrels are well made the heads and hoops securely and properly in place, even double-headed barrels of potatoes should not be loaded in this manner, but should be placed on end, as suggested for cloth top barrels.

LOADING NEW POTATOES.

Stock cars are generally used for the transportation of new potatoes from the southwest, as they afford plenty of ventilation, which is a prerequisite to satisfactory shipment. Extreme caution should be exercised by the shipper to see that the car is clean and the roof sound. If it is not, the attention of the railroad company should be directed to the defects and either another car should be secured or the defective and dirty one repaired and cleaned, as a dirty car often has a harmful effect on the potatoes.

Loading "Texas" style is the customary manner in the Southwestern States, where plenty of ventilation is required on account of



FIG. 15.—Method of loading potatoes in double-headed barrels.

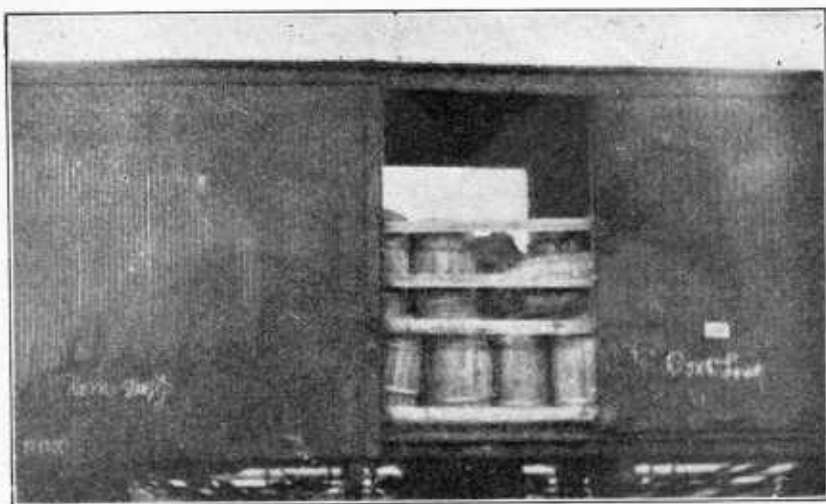


FIG. 16.—Carload of potatoes in cloth-top barrels ready for market.

the tenderness of the tubers, heat at time of shipments, and the usually long haul by the transportation companies. Most of the shipping from Texas, Oklahoma, Arkansas, and Louisiana, is made by individuals, who superintend their own loading. Usually two men are required to load, although on account of the size of the sacks one man should be able to load a car economically and satisfactorily. An aisle sufficiently wide to permit passage is left from end to end of the car for the purpose of ventilation and inspection. The sacks, which usually contain about 2 bushels, are placed on end from two to four deep on each side of the aisle depending upon the size of the car. Then one layer of sacks is laid flat on top, or two layers may be necessary over a part of the car, in order to reach the minimum carload weight.

In some sections of the West a small two-wheeled truck is used to advantage in cars, to truck sacks of potatoes from the door back toward the ends of the car when loading, or to truck from the ends when unloading. This makes the work of loading or unloading much easier and also saves time.

In loading potatoes in cloth or burlap-covered barrels the lowest tier in the car should always be loaded on end with tops up, and the next tier should also be arranged on end if the tier is filled entirely (see fig. 16). This tier is not usually filled and for that reason the last row across the car on each side of the doors should be laid down with the bottoms toward the end of the car. This is done to brace the standing barrels and make the load more secure. Potatoes in cloth or burlap covered barrels should never be loaded lying down, except for the few barrels to brace the load.

Potatoes in hampers should never be loaded on their sides, because the weight of the upper tiers, combined with the jolting or bumping of the cars, is too likely to crush the lower baskets or tear or force off covers. These hampers should be loaded alternately, the first one top down, the next bottom down and so on. This makes a much safer load and one that will ride well.

LOADING OLD POTATOES.

In the North the sacks are often loaded standing, one tier on end and then another tier on top of the first, during moderately cool weather or prior to October 1; in other cases the second tier of sacks is laid down on top of the first and across the car. To permit a free circulation of air in the car a little space is left between some of the rows.

In cold weather the sacks are usually laid flat, sometimes crosswise and sometimes lengthwise, in the car. They should be piled in even tiers so that they can be checked off and counted readily. In many sections, to prevent freezing in cold weather, a generous supply of straw is piled in the ends on the floor, along the sides of the car, and especially around the doors before loading.

MARKETING.¹

The distribution of the potato crop varies from year to year with the difference in production in the several principal growing States. Michigan shipped some of its 1915 crop into potato-growing districts of New York State which would have been shipping out hundreds of cars had their crop not been very light. The early potato-producing States of the South scarcely finish digging and shipping out in the spring and summer before they begin shipping in from the northern sections.

Many of the improvements needed to bring about better marketing depend largely upon the grower or shipper. A selling agent, no matter whether he is appointed by a number of growers to sell their crop, or whether he is a commission merchant in whose hands the grower places his potatoes, should have well-graded, uniform, and sound stock put up in a neat, clean, and attractive manner. As long as insufficient attention is given to proper grading and packing, just so long will the results in marketing be unsatisfactory. A cash buyer will usually pay a little more for well-graded potatoes than for stock not uniformly prepared.

¹ For a discussion of outlets and methods of sale for shippers of fruits and vegetables, see Fisher, J. W., jr.; Collins, J. H.; and Sherman, Wells A., *Outlets and Methods of Sale for Shippers of Fruits and Vegetables*, U. S. Department of Agriculture Bul. 266, 1915.

For explanation of distribution methods and charges in the city, see Collins, J. H.; Fisher, J. W., jr.; and Sherman, Wells A., *Methods of Wholesale Distribution of Fruits and Vegetables on Large Markets*, U. S. Department of Agriculture Bul. 267, 1915.

The marketing methods employed in the southern, or what is better known to the trade as the "new deal," and the northern, or "old deal," are somewhat different. This variance is brought about by different methods employed in handling the crops, periods of maturity, the perishability of the products, length of season, and local custom.

MARKETING SOUTHERN OR "NEW" POTATOES.

The southern crop, on account of its perishable nature, must be marketed quickly, while the northern crop can be held in storage for months. The shipments of the new crop from the Southwest begin in Louisiana and Texas about the 1st of May and continue ordinarily until about the 15th of June, when Arkansas and Oklahoma begin to ship. These districts usually ship until about the 5th of July, when the season of the district around Kansas City, better known as the "Kaw Valley" section, opens up, lasting about six weeks.

One distinctive feature of the "new deal" in the Southwest is that a large number of cash buyers representing different wholesale fruit and produce firms and distributing agencies scattered over the United States come to these sections to buy. The crops are usually sold through local representatives and through distributing agencies who have previously contracted with the growers to sell their crops, although there are many of the growers who sell their own. One advantage to the grower of having a selling agent on the ground is that through the agent handling the crops, the buyers are usually all quoted the same price, thus maintaining a stable, healthy market. The growers who are not selling through this agent apparently have the same outlet through the cash buyers without paying the selling agent's commission, but they do not have the same knowledge of market conditions or of supply and demand. The growers' agent also sells a good percentage of his shipments by wire to his buyers in distant markets at advantageous prices. Usually the independent grower has neither these market connections nor a knowledge of the financial or moral rating of the dealers. As a rule, cash buyers on the ground are quoted a lower price than is quoted to buyers in distant markets by wire.

These selling agents receive a commission on the selling price (or sometimes a fixed amount per car) from the growers and it is to their interest to sell the potatoes for as much as possible, since, when they are selling on a commission basis, their commission will be increased accordingly.

Selling methods along the Atlantic seaboard from Florida north to Virginia differ somewhat from those of the southwestern sections. The cash buyers and distributors are present, but much more consigning to wholesalers is practiced, especially in the Carolinas and

the Norfolk section. There are a number of thriving growers' cooperative marketing organizations in this territory, each employing a competent sales manager to sell the growers' output.

MARKETING NORTHERN OR LATE POTATOES.

Usually the "old deal" can not be handled on the same basis as the "new deal," because about three-fourths of the crop is stored by growers and warehousemen. In nearly every shipping section there are a number of local operators and outside distributors who purchase potatoes extensively at harvesting time and distribute them in car lots during the fall, winter, and spring to all parts of the country. At various points these operators have warehouses for storing the potatoes until they deem it advisable to sell and ship them. Usually the distributors have their main offices in the large cities and their warehouses at convenient shipping points in the potato districts. They buy either from the farmers direct or from the local warehousemen. The selling methods of the local warehousemen and the distributor are about the same, although the latter, perhaps, has the more adequate selling facilities on account of his trade connections.

MARKET OUTLETS FOR NORTHERN GROWERS.

In the field not dug or at an agreed price per bushel for the crop f. o. b. shipping point.—Occasionally a grower will sell his crop in the ground for a lump sum or at a stipulated price per bushel f. o. b. cars at shipping point; the former method, however, is unusual.

For cash by the load as hauled, selling to track buyers, local warehousemen, or distributors.—Growers may use this method and sell when they need cash or when convenient and other work allows time for sorting and hauling.



FIG. 17.—Local warehouse of fireproof construction. Driveway through the house facilitates unloading.



FIG. 18.—Long lines of these warehouses are a common sight at Maine loading points.

To cash traveling buyers in carloads.—A grower may make a contract with a track buyer to load one or more cars at a stipulated price. This method is general in some northern sections. The buyer or his representative is usually there to inspect the stock when the car is loaded. Potatoes which are defective in quality or do not come up to grade in some other particular, are thrown out, or an allowance is demanded.

To local warehousemen.—In most of the northern producing sections local men who have been growers at one time, or business men who saw an opportunity of extending their operations, have entered the potato storing and shipping business. Usually these local men have warehouses (see fig. 17), and some of them are equipped throughout with modern machinery for sorting and handling the potatoes. If the stock is placed in storage for the growers' account, the warehouseman may arrange with the grower to charge him a price per bushel for sorting and grading, as well as storing, and if he later sells the potatoes a commission on the selling price is added.

To distributors who may have local warehouses.—The distributor who has his warehouse at the loading station is an important factor in marketing northern potatoes. His storage facilities are an advantage, for they enable him to serve the small grower who has not sufficient acreage to warrant him in providing cellar storage of his own. In this way the business of the small grower may be secured at points where there are no local warehousemen. There are a number of reliable distributors operating at certain points in the late-potato districts each year, owning or leasing warehouses (see fig. 18), on whom the growers rely to some extent to buy or market their crops.

Shipping on consignment.—Although most growers and shippers prefer to sell outright, it is generally conceded that under present conditions the commission merchant is a necessary factor in the fruit and produce business. The success of this method of marketing depends very largely on conditions.

Frequently a grower will make the mistake of consigning to a concern of which he knows nothing, or of shipping his potatoes with no knowledge of market conditions or without notifying the commission merchant. It is obvious that the grower should use every effort to obtain accurate information as to the integrity and selling ability of those with whom he expects to do business and then keep in close touch with his agent, previous to shipping, in order that the latter may furnish him the very best information concerning the market conditions. He should always furnish his agent with complete information as to date of shipment, shipping point, car number, initials, route, and contents, either by letter or wire, to reach the commission merchant in ample time before the car arrives, so that arrangements for its sale may be made. Otherwise the merchant may have on track or due a number of other cars. The market may not be in condition to receive further shipments, making it necessary to hold the car on track or to sacrifice or divert it to another market.

One of the reasons why the grower does not receive the highest market price for his potatoes is that he has not learned to ship tubers of good quality uniformly graded. Often he will sell his best potatoes and consign the remainder. The commission merchant should not be condemned severely when the grower receives unsatisfactory reports on such shipments. Criticism should not be based on individual sales, but average results should be considered.

Selling by wire.—In some cases, particularly when he has had marketing experience, the grower may sell his crop to advantage by wire, in the same manner as does the distributor or buyer, as will be described later. Very few growers have the experience or the trade connections to market in this manner, so the method is not commonly used. The shipper or grower needs an intimate acquaintance or at least a satisfactory basis for dealing with the broker, buyers, and receivers on the markets. Some knowledge of railroad transportation is essential as well.¹ The ability to settle disputes satisfactorily and effect compromises is necessary.

Through a cooperative marketing organization.—Cooperative organizations for marketing table and seed potatoes are increasing in number. This method of marketing deserves the growers' careful consideration and loyal patronage. The possibilities of such organizations when efficiently managed and heartily supported by growers are almost unlimited.

¹ White, G. C., Demurrage Information for Farmers. U. S. Department of Agriculture, Bulletin 191, 1915.

DISTRIBUTORS' OUTLETS.

Since a large part of the northern crop is handled by large distributors, it is well that growers should know how these firms handle their shipments. Some of these outlets are also open to associations and to experienced growers.

The distributor may use several methods in making his sales, as follows:

Through his store in the city to the retail trade.—To sell through his store to the retail trade makes it possible for the distributor to hold a long line of customers who buy regularly or periodically, but who do not buy in sufficient quantities to patronize the produce yards.

A better average profit is secured in this way because to the distributor's car-lot profit is added that of the jobber's. Many times inferior products may be disposed of through the store to a certain trade to very good advantage, and it is often better to dispose of cars which must be sorted in this manner.

In straight car lots in the produce yards or by "breaking" cars to the jobbing or peddling trade.—In some cities an extensive business is carried on in selling "straight" or full cars and in "breaking" or selling by the load out of cars in the railroad produce yards. On the larger markets it is not unusual to see from 50 to 100 or more cars of potatoes on the tracks at one time to be sold. The railroad produce yards of one eastern city are located in the center of the wholesale-produce district, and a large percentage of the cars received are sold there in straight carloads to wholesalers, jobbers, chain stores, and peddlers. This is a quick and inexpensive method of selling and it is very desirable on account of the perishability of some commodities.

Breaking cars is a common method of selling, and a large volume of this kind of trade is carried on in connection with the car-lot business. The small jobber may buy in this manner in sufficient quantities to supply his requirements. Usually the distributor's gross profit on such sales is greater than in selling straight cars because his selling expense is heavier.

Consigning to another market either to a broker or to a merchant.—There usually comes a time in some districts when a distributor will be unable to sell all the crop for cash f. o. b. shipping point, or delivered, and will have to consign. On account of his trade connections and the volume of business he controls he probably feels more confident that he will receive fair treatment from the commission merchant than does the grower. The commission merchant is sometimes in a measure dependent upon the distributor for supplies. Sometimes the services of a broker are utilized by the wholesaler or distributor when consigning to outside markets.

Selling for cash to a track buyer at shipping point.—Track selling is carried on quite extensively in all potato-producing districts. The buyers may be traveling brokers or representatives of wholesale firms. Track selling is preferred by some distributors for the reason that the risk in transit due to decay, weather conditions, shrinkage, market decline, and other causes devolves on the buyer.

Selling by "wire" to the trade in other cities either to the wholesaler or jobber direct or through his own representative or broker.—Selling by wire is a very successful method when the wholesaler, shipper, or distributor has the proper market connections, namely, his own representative, a broker in the market, or a personal acquaintance with his customers. The sale may be consummated by telegraph on an f. o. b. shipping-point basis, in transit, or delivered. The distributor has accurate knowledge of how many cars he has to sell, the grade and quality of the stock, and should know approximately the quantities the different markets are receiving and the quantity moving from producing points. With this knowledge and information as to the general market conditions he can quote his products intelligently.

There are several forms in common use among the trade in quoting by wire or letter. The one most commonly used is given below:

BLANK CITY, MINN., October 10, 1915.

JOHN DOE, St. Louis, Mo.

We offer subject to confirmation shipment to-day number one Early Ohio potatoes one fifty bushel sacked fob here.

JONES & SMITH.

ST. LOUIS, MO., October 10, 1915.

JONES & SMITH, Blank City, Minn.

Ship John Brown here car number one Early Ohios to-day price quoted confirm with car number weights routing.

JOHN DOE.

BLANK CITY, MINN., October 10, 1915.

JOHN DOE, St. Louis, Mo.

Shipped John Brown Great Northern nineteen thousand four sixty containing three hundred thirteen sacks weight thirty-seven five sixty routed Burlington.

JONES & SMITH.

In the foregoing wires, Jones and Smith are the shippers of potatoes, located in Blank City, Minn.; John Doe is the broker located at St. Louis, and John Brown is the broker's customer.

When the sale is consummated a record is made of the order, the broker's name, and all particulars. The brokerage on potatoes ranges from \$5 to \$10 per car, usually each principal paying for his own wires.

RAILROAD BILLING.

There are several ways in which a bill of lading for a car of potatoes may be made.

The car may be billed open to the consignee.—A car may be billed direct to the consignee without an endeavor to secure pay for the potatoes before they are delivered to him. Unless the shipper has confidence in the consignee and knows that he will receive honest treatment at the merchant's hands, billing open is not recommended. However, a large volume of business is conducted in this manner every year.

Billed to the broker or representative.—Large selling organizations and distributors are billing to their broker or representative to some extent. It insures prompt action on the sale of the car, prompt reconsignment of rejected cars, and gives the shipper a personal representative on the ground to look after his interests. The shipper should know of the ability and integrity of the broker or representative.

Billed to the shipper, "shipper's order" notify the consignee.—Sometimes shipments are billed on the "Shipper's Order" form of bill of lading to the shipper himself and a notation is usually made thereon to "permit inspection." Unless the buyer or his agent purchases and inspects the commodity at shipping point, nearly all perishable products are sold with the privilege of inspection at destination. The original bill of lading is usually attached to a draft and sent through the shipper's bank or direct to a bank in the buyer's city. When the car is accepted and draft paid, the buyer receives the bill of lading which, when presented to the railroad, entitles him to possession of the car. Shipping perishables "order notify" is not considered by some of the largest distributors the best practice. As the original bill of lading is usually in the bank attached to the draft, and is therefore out of the possession of the shipper, if the car should be rejected it could not be reconsigned until the return of the bill of lading from the bank or until the shipper could furnish a satisfactory bond to the railroad company. The delay thus entailed on perishables is dangerous and may mean a serious loss to the shipper.

Billed to the shipper, advise or notify the consignee.—The shipper by billing a car to himself, "advise" the consignee, using the "straight" bill of lading, provides a safeguard for himself and at the same time also provides a way by which the car can be expeditiously reconsigned in case it is rejected. When the billing is made out by the shipper billing the car, to himself, advise the consignee, he should note on the bill of lading whether or not inspection

is to be permitted. Since this method of billing has come into use within recent years, not only many shippers but some railroad agents are not familiar with it, and the latter may request a statement on the bill of lading authorizing the railroad to deliver the car upon presentation of the consignor's written order without surrender of the bill of lading.

An order is made out by the shipper to the delivering railroad company to deliver the car to the buyer upon presentation of this written order without original bill of lading. This order should contain a description of the shipment, giving such information as the shipping point, date shipped, car number and initials, contents and the manner billed, and should be made out on the shipper's letterhead. This order is attached to the draft and either sent through the shipper's bank or direct to a bank in the buyer's town. After the buyer inspects the car and decides that it is satisfactory, by paying the draft he secures possession of the order or release notice, which, when presented to the railroad, entitles him to possession of the car. The delivery notice in this case answers the purpose of a bill of lading to the buyer. If he chooses, the shipper may send to the delivering agent a carbon copy of the delivery notice, also on his letterhead, accompanied by a letter. This prevents misunderstandings of any kind and makes it impossible for the person notified or anyone else to present to the agent a forged order for the delivery of the car.

The advantage in this manner of billing is that the original bill of lading is retained by the shipper and in the event the consignee rejects the car the shipper can reconsign it without any loss of time. Immediate delivery to other buyers may be secured on rejected or diverted cars by telegraphing a release order to the delivering railroad. A number of large shipping organizations are using this method of billing very successfully.

Billed to the shipper himself.—Some distributors or shippers bill their cars to themselves and divert or reconsign from shipping end. When shippers are unable to sell all cars as loaded, it is customary to bill to themselves at some distant city or gateway, expecting to sell while in transit or on arrival. In case of an anticipated rise in the market price this method is often followed, as it may give the distributor several days more time while the car is in transit to take advantage of market prices.

In the event such a car is to be reconsigned or diverted the shipper should notify the railroad agent at shipping point to whom the car is now to be billed, destination, routing, and contents.

In the case of a sale negotiated between the shipper at point of origin and a purchaser in a distant city when the car is billed in this manner, delivery may be accomplished by the shipper wiring the agent of the final carrier to deliver the shipment to the purchaser.

This wire should contain all the facts as to point of origin, date shipped, car number and initials, contents, route, and manner billed.

SHRINKAGE.

A great deal of complaint has been heard on the insufficient allowance made the buyers for protection on actual and natural shrinkage. On the other hand, it is claimed that in some instances an unfair advantage has been taken of shippers or that unreasonable claims are made by receivers.

The natural shrinkage on old potatoes is not as large as on new potatoes. At the same time, in justice to the buyer and seller and for the protection of both, there should be a clear understanding between them on this subject before the sale is consummated. So much dissatisfaction has arisen and so much loss has been encountered from this cause that some reform or the adoption of uniform rules is needed. The question is of great importance to shippers and dealers and will warrant careful investigations to determine what rules should govern.

In the absence of an understanding between the principals the following rules have been observed in some localities:

On sales of western and southwestern potatoes made by wire, terms f. o. b. shipping point, and shipments "billed open" to the purchasers, loading point weights govern.

On sales made on a delivered basis it is customary in many cases to include guarantee of invoice weight within 2 per cent for natural shrinkage on old potatoes and on new potatoes 5 per cent, excepting in several States, such as Maryland, Virginia, and New Jersey, where the guaranty is within 4 per cent.

On f. o. b. shipping point sales, in cases where the potatoes have been billed shipper's order, notify the consignee, the same rule applies as if the terms had been made delivered in the first place, and the shipper guarantees the weight on new potatoes within 5 per cent natural and on old potatoes within 2 per cent. In this case the title to the potatoes does not pass to the buyer or receiver until they arrive at the receiving end.

Serious complaints are made of the unnecessary shrinkage and losses on account of dirt in shipments, as much as 5 or 10 pounds sometimes being found in one sack. It is realized that there is some reason for a limited amount of dirt on shipments dug and forwarded during or following rains, but it is certain that by exercising more care in handling, a large part of the dirt could be eliminated. The use of mechanical sizing or sorting machines is also an aid, since the potatoes are likely to dry off partially, and much of the dirt is rubbed off while going over the machines.

WEIGHING.

There has been considerable dissatisfaction among some buyers and receivers over the loose manner now in vogue of weighing potatoes. It is believed that too little effort is made by shippers to have the weights absolutely accurate and to secure scale tickets.

In the absence of a public weighmaster, all weights should be attested and the buyer should receive a copy of the scale tickets and affidavit. This precaution would enable the buyer, should there be a shortage of sacks, to fortify his claim properly against the railroad company.

In many sections of the North Central States the potatoes are weighed as sorted; in fact, most sorting machines have a bag attachment at one end, the bag being placed on a scale and weighed as the potatoes come out of the machine. To dispel any doubt as to the accuracy of the scales, either a public weighmaster should have supervision of the weighing or the scales should be tested frequently and the buyer given an affidavit as to the correctness of the weights.

The safest method is to have every load hauled contain the same number of sacks and have each load weighed and properly recorded over a public or other wagon scale. Potatoes can not be as accurately weighed, one sack at a time, as in loads over large scales.

SUMMARY.

In the large commercial fields machine potato diggers are probably the most economical means of digging when conditions favor their use.

More care must be used in all kinds of digging and handling, and especially in machine digging, to avoid the present large loss and waste from cut and bruised potatoes. Much of this loss is unnecessary and can be avoided by exercising a reasonable amount of care.

Picking directly into crates, which may be loaded upon wagons and hauled to cars or storage, is a better practice than methods which require emptying, rehandling, or shoveling several times.

The results of shipping machine-sized potatoes have been freely commended by buyers and wholesalers. This method should be more accurate, rapid, satisfactory, and when properly managed, more economical than hand sizing.

Machine sizers, usually called graders, will grade potatoes according to size only; in addition, the grower or shipper must give careful attention to the grading for quality. A good practical sizer should have a large apron or table from which the operator may sort the defective tubers and should have a long belt or other sizing device to give the potatoes a sufficient distance to travel in order to be sized

properly. A constant supply of potatoes should be available in order to obtain the most economical results and the fullest service of machine and men.

Enormous waste and losses are prevalent in the marketing of this crop, largely owing to the lack of standards, proper grading, and careful handling.

Wholesalers, retailers, and consumers are demanding the use of grading and handling methods which will guarantee a more satisfactory product, that can be sold more readily and prepared for the table without unnecessary loss.

It is a common statement, and it seems reasonable to believe, that the consumption of potatoes could be increased materially if nothing but well-graded stock were marketed.

Northern potatoes shipped direct from the field at harvest time should receive more careful grading, because the market for later shipments is injured by the shipment of unsatisfactory field stock.

It is an error for growers knowingly to ship potatoes for table use which have been frosted or are affected with blight or other diseases without sorting out all damaged tubers. The payment of freight charges on cull potatoes should be avoided by keeping the culls on the farm.

Potatoes should always be bought from growers by middlemen strictly on their merits. This would reward the careful grower and encourage better grading methods.

In the North dealers and warehousemen are now allowed or forced to do most of the grading. In this way growers lessen their chances of selling direct to city dealers or cash track buyers.

The establishment of uniform standard grades for potatoes is acknowledged to be of the utmost importance, as the greatest need of buyers and sellers is a fixed basis on which to deal.

The fact that standardized products, which may be sold by sample or description, can be handled on a narrower margin of profit than products not uniformly prepared should be an incentive to growers and shippers to adopt adequate standards for this crop.

From present practices two well-defined commercial grades for potatoes appear both necessary and adequate. A special grade may be found advisable for selected, special-purpose stock.

Fruits and vegetables sell largely on their appearance; therefore it is a mistake to attempt to market nearly all of the crop under the first grade unless the potatoes are of strictly first-grade quality. This grade should be made as good and attractive in appearance as is practicable and reasonable. There is an outlet for a No. 2 grade of potatoes; therefore dealers and consumers desiring No. 1 potatoes should not be forced to use ungraded or poorly graded stock.

Cooperative marketing organizations have proven to be the most efficient agencies in securing a standardized output of potatoes or other vegetables or fruits.

Only new, clean, strong, uniform-sized containers should be used. The 2-bushel burlap bag is believed to be a practical and desirable container to replace the assorted sizes and types of sacks and barrels now used.

Suitable brands are recommended for the best graded potatoes if their quality is always maintained.

Potatoes in any type of container should be loaded into cars securely to prevent loss and damage and claims of all kinds.

Growers should study their marketing situation to learn of all possible outlets and the persons and firms through and to whom they may dispose of their crops. A knowledge of the financial and moral responsibility of these agencies is important and a personal acquaintance very desirable.

The grower's careful attention to the details of selling and forwarding shipments, such as quoting prices by letter and wire, making bills of lading, and advising consignee of details regarding shipments, will save many misunderstandings and losses.

Efforts should be made to avoid unnecessary shrinkage in transit, and every precaution should be taken to secure accurate, complete scale weights.

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